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Elena Stavrova

Money Supply and Its Role in Economic Growth

Elena Stavreva, Ph.D., is an Associate Professor at the SWU "Neofit Rilski"-Blagoevgrad, Faculty of Economics. She is member of the Union of Scientists in Bulgaria and the Union of Economists in Bulgaria. Assoc. Prof. Stavreva works in the field of finance and banking. Contact: stavrova@swu.bg.

Abstract: This article examines the current trends in the development of cash circulation in the Republic of Bulgaria in connection with the intensified debates in foreign media and analyses of the need for a decisive limitation of cash and the mass use of non-cash payments. A comparative study of the place and role of cash in the economies of some EU countries, as well as the most important word economics system, whose financial systems are very clearly pursuing a policy of transition to a "cashless world", etc.The main economic and social factors influencing the "payment infrastructure" in different countries and the prospects for the development of cash flows and economic growth in their relationship with non-cash payments in the world over the next decade are also analyzed. The specifics of the development of cash in the Republic of Bulgaria in the period since 2014 and its relationship with economic growth in the context of the currency board and the upcoming accession to the euro currency area are studied.

Keywords: Money Circulation, "Payment Landscape", Cashless Payments.

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Introduction

Economics has always had a strange and much-discussed relationship with money as an economic category. Although money was initially viewed solely as a medium of exchange, the evolutionary development of the theory, however, builds on the work of John Maynard Keynes and Hyman Minsky, after which analyses have moved away from a narrow focus on the quantity of money to consider its structural impact on the real economy and the financial system. A structural understanding of money and finance becomes even more important in an increasingly digitalized and cashless world, because there is an increasing need for politicians to act not only as active market participants, but also to act as proactive market modelers. A cashless world is not only changing the relationship of citizens and businesses with money and creating new opportunities for the way they manage or even conceive of it; it is also putting new pressure on central banks to rethink their role and become more innovative in managing the monetary economy.

1. Theoretical foundations

At its core, understanding the relationship between money supply and inflation often begins with the Quantity Theory of Money (QTM). This theory (Friedman, 2010) postulates that the general price level of goods and services in an economy is directly proportional to the amount of money in circulation. The core of QTM is represented by the equation of

exchange: MV = PQ, where M is the money supply, V is the velocity of money (the rate at which money changes hands), P is the price level, and Q is the quantity of goods and services produced. The theory traditionally assumes that the velocity of money (V) is relatively stable in the end and that the quantity of goods and services (Q) is determined by the productive capacity of the economy. Under these assumptions, changes in the money supply (M) lead directly to proportional changes in the price level (P), implying a direct relationship between money supply (as a significant component of M) and inflation. Historically, the QTM has been influential in explaining the long-run relationship between money supply growth and the rate of inflation. For example, if the amount of money in circulation increases faster than the production of goods and services, prices are expected to rise. However, the stability of the velocity of money, a key assumption of the QTM, may not always hold in reality, especially as new payment technologies emerge and economic conditions evolve. Factors such as consumer confidence, interest rates, and the availability of alternative payment methods can significantly affect the velocity of money, potentially weakening the direct relationship between money and inflation.

Keynesian economics, (Zahariev, 2012) on the other hand, prioritizes the role of aggregate demand and assumes that factors other than the money supply are crucial in determining inflation and economic activity. Keynesian theory introduces the concept of liquidity preference, which describes the desire to hold money in liquid form rather than investing or sending it. This preference can significantly affect the velocity of money; for example, during times of crisis, people and economic agents may prefer to hold cash. This generally leads to a decrease in the velocity of money, even if the money supply increases. In the Keynesian framework, inflation can arise from "demand" pressures, when aggregate demand exceeds the economy's potential output, or from "cost" factors, such as rising costs of production. Although money supply and money supply are recognized as factors that can affect interest rates and therefore investment, they are not considered the only determinants of inflation and economic growth. Government spending and fiscal policy are seen as equally important tools for influencing aggregate demand and potentially inflation. Therefore, simply controlling money supply may not be enough to manage the economy, as other factors such as consumer confidence, investment decisions, and fiscal policy can play a significant role in stimulating both inflation and growth.

Helen of Troy may have had the “face that launched a thousand ships,” but Bill Phillips has discovered the curve that macroeconomic debates show no sign of stopping. Bill Phillips observed that unemployment and inflation appear to be inversely related. The original Phillips curve showed (Michaelides, 2024) that as the unemployment rate increases, the inflation rate decreases. The Phillips curve provides another theoretical perspective through which to understand the relationship between monetary policy, including money supply management, and macroeconomic outcomes. Expansionary monetary policy, which may involve increasing the money supply (including cash), could stimulate aggregate demand and economic growth, potentially leading to lower unemployment in the short

run. However, according to the Phillips curve, this reduction in unemployment may come at the expense of higher inflation. Conversely, contractionary monetary policy, aimed at reducing inflation by restricting the money supply, could potentially lead to higher unemployment. The concept of a non-accelerating inflation rate of unemployment suggests that there is a natural rate of unemployment below which inflation will tend to rise. Policymakers are often faced with trade-off decisions between maintaining low and stable inflation and achieving full employment, and managing the money supply, as an instrument of monetary policy, has implications for both goals.

To construct the aggregate account for the various national accounts, we can use algorithms. However, our choice must take into account the necessary information related to cash flows, as well as the possibilities for providing it. For this purpose, according to M. Hristov (2016) the following must be taken into account: first, by their nature, cash flows represent traffic of moving cash (coins and banknotes) in the units of the economic ecosystem and accumulations or reserves in banking institutions; second, the entities among which this movement of money takes place, i.e. for the aggregate economic entities that use accounts in national financial institutions; third, there is a relationship between cash flows over time and fourth, the strength of this relationship - the relationship between the dynamics of cash flows and the money supply that serves economic entities, is assessed with the monetary aggregates M1, M2 and M3. Despite numerous theories, we can confidently assert that so far, not only in theory, but also in practice, an adequate theoretical model for the problem of establishing the amount of money in circulation and the demand for money has not been found. The practical value of the ideas in this regard is small, i.e. the quantity demand for money proposed in the theory of Karl Marx, the equation of exchange by Irving Fisher, the equation of liquidity preferences by John Maynard Keynes and the equation of demand for assets by Milton Friedman do not give society an adequate answer - how much money it ultimately needs. A generally accepted rule is that it is impossible to conduct a successful monetary policy related to the supply of money without knowing what the demand for money is.

However, this theoretical approach provides an opportunity for the realization of an excess supply or a shortage of demand for money in the development of certain processes in the financial ecosystem. All this is due to insufficient information about the state of cash flows, whose parameters depend on the behavior of economic agents in a given period of time, which is related to the demand for money. This is because in an ecosystem, its constituent units - each separately or aggregated by certain characteristic economic entities are not able to realize an accelerated cash flow without the presence of an entity that seeks money. On this basis, we can agree that over a limited period, the parameters of the demand for money are closely related to the total amount of all outgoing cash flows of economic entities. We can define this total amount as the minimum volume of demand for money. Practice shows that its maximum level is significantly greater than the total

amount of outgoing cash flows a given period. This means that the total amount of outgoing cash flows can only serve as a guideline in conducting monetary policy, which is related to the money supply. This is because the effects that the cash outflows of the aggregate economy's entities realize during the selected time period are a function, also, of the velocity of money, calculated not only through the Gross Domestic Product (GDP) by using the money turnover in the national financial system. G. Mihaylova (Mihaylova, 2016), Y. Hristozov (Hristozov, 2016) in their reports to the conference, they defend the scientific thesis of the relationship between money supply, inflation and economic growth as the main criteria for joining the Eurozone. The document highlights global trends in cash circulation, emphasizing the debate surrounding the transition to a cashless society. While many governments and financial institutions promote electronic payments, cash remains a fundamental part of the global economy. The key trends include:

Growth of cash in circulation

The instability of the financial and economic ecosystems, interstate restrictions and sanctions provoke intense debates about the need for cash, as well as some extreme opinions about its abolition due to its use in criminal schemes and operations. Despite the intensity of all these actions, however, cash circulation retains, but in most countries increases its intensity. Regardless of the widespread adoption of cashless payment methods, the amount of cash in circulation has been increasing globally. Data from the European Central Bank (ECB) indicates that the total number of euro banknotes in circulation has grown significantly over the last decade. Similarly, the U.S. Federal Reserve continues to print billions of dollars annually to meet demand. Even in developed economies that advocate for digital payments, cash usage remains resilient due to concerns over financial security, digital fraud, and transaction fees.

The role of central banks and policies

Central banks, as institutions implementing monetary policy, play a key role in guiding the transition to a cashless society. While their primary task is to maintain price and financial stability, central banks now face new challenges and opportunities in the context of widespread digitalization in the economic ecosystem. To meet these challenges, central banks need to rethink their roles and functions in the digital age. Some governments and central banks support cashless payment initiatives as a way to combat the informal economy, tax evasion, and financial crimes. However, research suggests that eliminating cash could lead to economic instability, as cash provides a reliable store of value during financial crises. Central banks continue to print new currency, signaling that cash will remain relevant alongside digital payment systems. Recent research on cash flow and growth explores various aspects of their interconnection has established a relationship that expresses the expected return on a company's stock in terms of the expected growth in free cash flow. The results of the study show that cash flow growth is positively correlated with stock returns. There is also additional information that is reflected through cash flow growth

relative to cash flow, earnings, and dividends, and operating activity explains more than the company's investment activity. The author found that $1 invested in the portfolio with long-term and short-term cash flow growth grew to $15.30 during the period under review, while $1 invested in the stock market grew to only $9.85. (Jansen, 2021).

2. Econometrics research

Our econometric model aims to show the relationship in the period from 2014 to 2024 between key macroeconomic variables that have a clear dependence and show a strong influence on the parameters of the available money supply: *Money* - the parameters of the Mo of the available money supply; *DESI* - Digital Economy and Society Index; *ATM* - the number of Automated Teller Machines; *Bank Accounts* - the number of bank consumer accounts; *Payments cards* - the number of issued bank cards for cashless payments; *POS* - point of sale; *Internet payment* - parameters of internet transactions; *GDP/PC* - gross domestic product per capita. To prove the levels and direction of impact and the relationship between them, we have used popular econometric techniques, which we will show below. Based on the constructed time series of the values of the analyzed variables, we constructed the following regression equation:

$$Money = 0{,}3175 - 0{,}0036.DESI - 0{,}0296.ATM - 0{,}0607.BankAccounts + 0{,}4582.PaymentsCard - 0{,}0275.POS + 0{,}1006.InvestmentPayments + 0{,}0901.\left(\frac{GDP}{PC}\right) \quad (1)$$

Table 1. The regression equation variable

Variable	Coefficient	Std Error	t-Statistic	P-value
Const	0,3157	0,1667	1,8943	0,1545
DESI	-0,0036	0,0024	-1,5204	0,2258
ATM	-0,0296	0,0901	-0,3286	0,7641
Bank Accounts	-0,0607	0,1337	-0,4535	0,681
Payments cards	-0,4582	0,3329	1,3762	0,2625
POS	-0,0275	0,0827	-0,3328	0,7612
Internet payment	-0,1006	0,1006	0,9996	0,3912
GDP/PC	0,0901	0,1196	0,7531	0,5061

Source: Author's calculations

R-squared = 0.739: The model explains about 73.9% of the variation in the dependent variable (Money), which is relatively high.

Adjusted R-squared = 0.130: This is low, likely due to the small sample size (only 11 observations) and the number of predictors.

p-values for all predictors > 0.05, indicating that none of the independent variables are statistically significant at the 5% level in this model.

High condition number (1.86e+03): Suggests potential multicollinearity among predictors.

Intercept	0.3157	Baseline level of Money when all predictors are 0 (theoretical, rarely meaningful by itself).
DESI	-0.0036	A unit increase in DESI is associated with a *decrease* of 0.0036 in Money, holding all else constant. Indicates higher digitalization may reduce cash use.
ATM	-0.0296	More ATM usage is slightly associated with *less* Money growth—perhaps due to a shift toward electronic payments.
Bank Accounts	-0.0607	An increase in bank accounts is associated with *less reliance on cash (Money)*, supporting financial inclusion.
Payment's card	+0.4582	This is a large positive coefficient: suggests that card payments might correlate with higher Money, possibly due to transitional effects. However, this seems *counterintuitive* and may indicate multicollinearity or confounding effects.
POS	-0.0275	More POS usage correlates with a *decline* in cash-based Money. Logical, as digital payments replace cash.
Internet pay-ments	+0.1006	Surprisingly *positive*: could be due to behavioral lag or indirect effects—may warrant deeper look or interaction terms.
GDP/PC	+0.0901	Slight positive association; higher income might lead to greater cash holding in some contexts, but it's weak.

- None of the variables were statistically significant (all p-values > 0.05).
- Multicollinearity exists (e.g., DESI VIF = 6.06), which can inflate standard errors, making it harder to detect significance.
- The Payments card variable is highly influential, but its sign may be distorted by correlations with other predictors.
- R-squared = 0.739: The model explains about 73.9% of the variation in the dependent variable (Money), which is relatively high.
- Adjusted R-squared = 0.130: This is low, likely due to the small sample size (only 11 observations) and the number of predictors.
- p-values for all predictors > 0.05, indicating that none of the independent variables are statistically significant at the 5% level in this model.
- High condition number (1.86e+03): Suggests potential multicollinearity among predictors.

Correlation matrix (fig. 1) analysis show the next connectivity: The correlation matrix quantifies how strongly each pair of variables is linearly related. Values range from: +1: Perfect positive correlation; 0: No linear relationship; -1: Perfect negative correlation

Let us focus on how each independent variable relates to Money:

- *DESI (-0.56)*: Moderate negative correlation. As digitalization increases, cash usage (Money) decreases — consistent with economic theory.

- *ATM (-0.24)*: Weak negative correlation — more ATM use slightly reduces Money, possibly indicating a shift to digital payments.
- *Bank Accounts (+0.43)*: Moderate positive correlation. More bank accounts could increase financial engagement and temporary cash balances.
- *Payment's card (+0.55)*: Moderate positive correlation. Surprisingly, more card use is associated with more Money, possibly due to transitional factors or multicollinearity.
- *POS (+0.38)*: Weak to moderate positive — POS systems may complement cash transactions in early adoption stages.
- *Internet payments (+0.22)*: Weak positive correlation — possibly reflects indirect behavioral patterns rather than a direct cash substitute.
- *GDP/PC (-0.25)*: Weak negative correlation — higher income may be associated with reduced need for cash, but the link is weak.

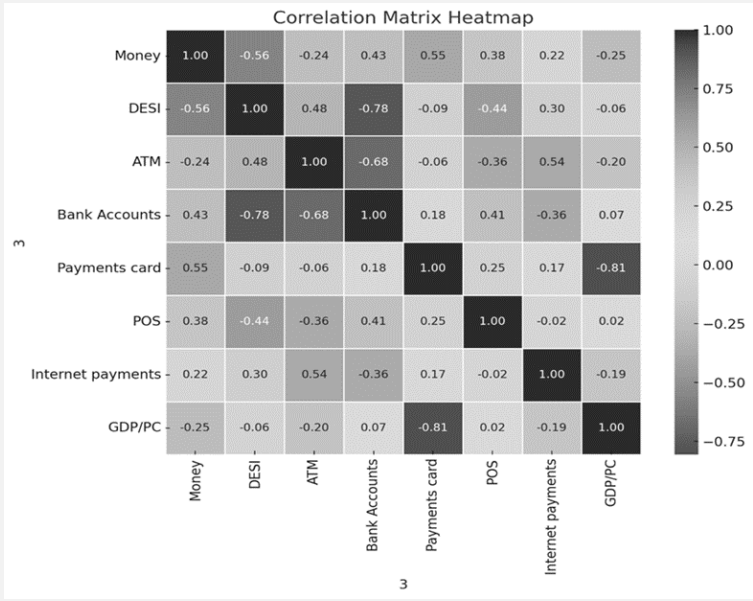

Fig. 1. Correlation matrix. Source: Author's calculations

Some predictor pairs show strong correlations, suggesting multicollinearity:

- *DESI & Bank Accounts (-0.78)*: strong inverse relation — combining or excluding one could help reduce multicollinearity.
- *Payments card & GDP/PC (-0.81)*: unexpectedly strong negative — could distort regression coefficients.
- *DESI & ATM (+0.48):* moderate — may share common trends in infrastructure rollout.
- *ATM & Bank Accounts (-0.68)*: strong negative — these may serve as alternative financial access tools.

Granger causality test is a valuable tool for exploring the dynamic relationships between time series variables and assessing their predictive power for one another. It helps in building better forecasting models, understanding economic interdependencies, and testing theoretical relationships.

Table 2. Granger Causality Results

Lag	F-test P-value
1	0,9679
2	0,0838

Source: Author's calculations

Interpretation of Granger Causality Results (table 2): 0.9679 — Very high p-value — no statistical evidence that GDP/PC Granger-causes Money. Changes in GDP/PC at lag 1 do not help predict Money. 0.0838Moderately low p-value — at the 10% significance level, there is some weak evidence that GDP/PC Granger-causes Money. This suggests a possible delayed effect, where GDP per capita from two years ago may influence Money today. There is no strong evidence that GDP/PC causes changes in Money in the short term. At lag 2, the p-value (0.0838) is below 0.10 but above 0.05, which means: Statistically, you could say there is marginal evidence of causality if you are using a 10% threshold. It is not strong enough to confirm causality at the more conventional 5% level. Here are the Granger causality test results for the reverse direction — testing whether Money Granger-causes GDP/PC: At lag 1, the p-value is 0.1179, indicating weak evidence (significant at the 10% level). At lag 2, the p-value is 0.1967, which is not statistically significant. There is some marginal evidence that Money may help predict GDP/PC with a 1-year lag. However, no strong evidence of causality is found at 2 lags.

Table 3. Results of the Augmented Dickey-Fuller (ADF)

	Variable	ADF-statics	P-value	Critical value	Stationary
1	Money	-2,4064	0,1399	-3,2899	False
2	GDP/PC	-4,5828	0,0001	-3,2899	True

Source: Author's calculations

Here are the results of the Augmented Dickey-Fuller (ADF) (table. 3) test for stationarity:

- Money: Not stationary ($p = 0.1399 > 0.05$)
- GDP/PC: Stationary ($p = 0.0001 < 0.05$)

What This Means:

- Granger causality tests assume stationary time series.
- Since Money is not stationary, the Granger results involving it may not be fully valid unless the difference the series

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Conclusion

The velocity of money circulation, defined as the rate at which money changes hands within an economy, is a critical economic indicator. Historically, it has served as a barometer of economic health, signaling imbalances, potential crises, and sectoral accumulations. Its positive impact on economic development stems from its role in maintaining trust, as timely debt repayment demonstrates financial capacity and commitment. Digitalization further enhances this effect, strengthening economic relations and trust within the ecosystem.

Efficient money circulation mitigates default risk, thereby stabilizing the economic system. Furthermore, the fulfillment of financial obligations releases resources for investment and productive expenditure, stimulating economic activity and fostering long-term growth. The significance of money velocity has been recognized by various economists, who have examined its implications from diverse perspectives.

Finally, yet importantly, the role of stimulating investment in the economy is also important. By fulfilling debts, financial resources are released that can be used for investment or productive spending in the future. This can stimulate economic activity and promote long-term growth.

The velocity of money circulation is a crucial factor in the economy and different economists have considered its importance from different perspectives. Authors such as Milton Friedman, Irving Fisher, John Maynard Keynes, Friedrich Hayek, John Kenneth Galbraith, and Karl Marx have contributed to our understanding of this concept.

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